LABORATORY: CNR-ISPC

NAME OF THE INSTRUMENT

Cameras and photogrammetry instruments

GENERAL IDESCRIPTION:

Photogrammetry is the science of extracting metric information from photographs. Recently, thanks to technological innovation and the use of Computer Vision, automated photogrammetric techniques have been developed. These techniques allow the elaboration of 3D models, starting from a very dense sampling of two-dimensional images, using automated procedures, to be performed. CNR-ISPC uses various image-based techniques to process 3D models:

● *Multi stereo view reconstruction*: this is a photogrammetric technique of automatic processing. In addition to the traditional photogrammetric principles, this technique also takes advantage of algorithms *structure from motion* e *dense stereo reconstruction* that make it possible to analyse and correlate photographs automatically and extract coloured point clouds.

● *Spherical photogrammetry*: Thanks to the evolution of surveying techniques and in particular spherical photogrammetry, it is now possible to use panoramic images or photos (360° spherical images) not only for "traditional" monoscopic VR navigation (such as QTVR) but it is also possible to georeference the images, extract 3D geometries and, above all, project high-resolution textures onto the 3D models surfaces. The technique guarantees high accuracy and completeness of the data. It is also possible to integrate the results with data from other surveying techniques such as laser scanning. Spherical photogrammetry is well suited to support the creation of immersive contents and their use within interactive navigation systems based on HMD (*Head Mounted Display*), devices. An example of an advanced immersive system is the DPF (Depth Panoramic Frame), a technology that allows a stereoscopic vision of the reconstructed scene using only two images - or videos - with spherical projection: one with colour information (diffuse map) and one with depth information (depth map).

The instrumentation of the CNR-ISPC Laboratories used for photogrammetric acquisitions is as follows:

- 2 Canon Eos R with lenses and accessories
- 1 Canon Eos R5 with lenses and accessories
- 1 Insta 360 Pro 2
- 2 Kit Flash Profoto B1X Location
- 4 Lighting Kits Lupo Actionpanel dual color

TECHNICAL DETAILS:

Set of tools dedicated to photogrammetric surveying in archaeological contexts (archaeological sites, hypogeal contexts, and historical buildings) and museum collections (statues, ceramics, etc.).

2 Canon Eos R Cameras

Mirrorless cameras with a full-frame CMOS sensor measuring 36 x 24 mm and featuring 30.3

megapixels, allowing for the capture of high-definition images with great detail. The autofocus system employs phase-detection with image sensor (Dual Pixel CMOS AF) and sensitivity ranging from EV -6 to 18 (ISO100). Real-time exposure measurement at 384 zones with image sensor. Electronically controlled focal-plane shutter with speeds from 30 to 1/8,000 sec (in increments of 1/2 or 1/3 stops) Bulb mode. Video recording capabilities include MP4: 4K (16:9) 3840 x 2160, Full HD, HD; Variable bitrate MPEG4 AVC/H.264, Audio: AAC/Linear PCM.

2 Profoto B1X Location Flash Kits

Wireless external flashes with remote or manual shooting capability. The flash has high luminous intensity with adjustable 500 Ws power. The lithium-ion battery allows for over 300 flashes at maximum power.

4 Lupo Actionpanel Dual Color Lighting Kits

Compact LED interior lights, dimmable from 0 to 100%, flicker-free operation, and variable color temperature control ranging from 3200 to 5600K. They can be powered by either cables or battery for use in areas without electricity.

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Dedicated set of tools for photogrammetry and architectural annotation using equirectangular images (360 panorama).

Insta 360 Pro 2

Dedicated tool for capturing spherical HDR videos and photos.

The 4K resolution of the final images results from the fusion of 6 synchronous shots taken by an equal number of wide-angle cameras arranged polarised around the axis of the device.

The camera is equipped with Farsight technology that guarantees a high-definition, low latency video stream and optimises remote preview. The Farsight device consists of a Transmitter and Receiver that guarantee camera control at a distance limit of 300 metres.

Canon EOS R5 with Manfrotto Pan Head and Tripods

A full frame mirrorless camera equipped with a manual pan head and tripod for the production of very high-resolution spherical panoramas.

The quality of the main data (video and photos) is adequate for a dual use of the tool:

- annotation of architectural interiors by metadata of panoramic images
- digital photogrammetry applications (also with high resolution) on historic buildings using the photos produced by the devices.

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Cameras

Lights (Flash/Led)

INSTA 360 PRO 2 AND FARSIGHT SYSTEM

PAN HEAD MHPANOVR

CANON EOS-R5

TRIPOD MT190XPRO4